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MEDICAL SCHOOL

Airway Inspector

Chest Imaging Platform

Airway Inspector- Intro

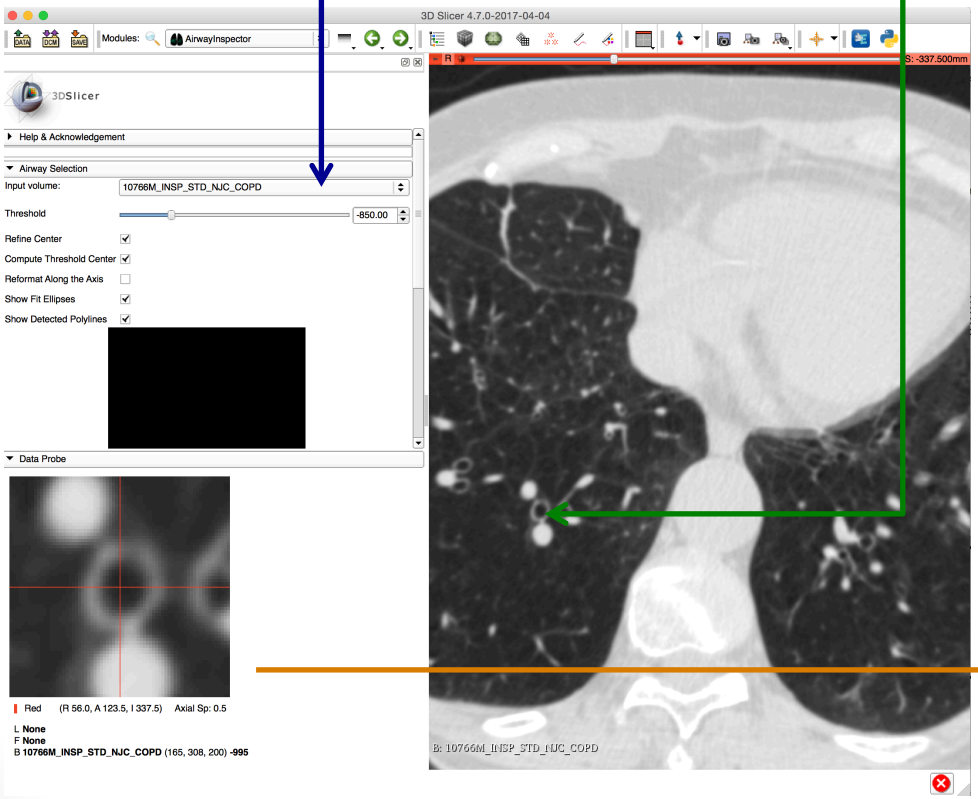
- Goal: Assessment of airway wall thickness and airway lumen size.
- Airway wall thickening and lumen narrowing is a biomarker of obstructive lung diseases like Asthma and COPD.
- Automated airway wall segmentation from user-defined airway locations

References:

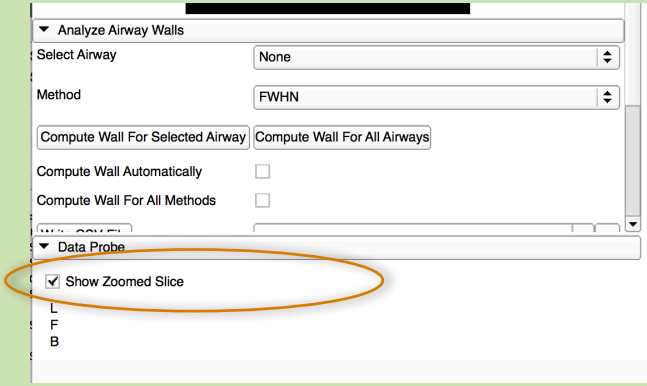
1. Overview: https://acil.med.harvard.edu/publications/three-dimensional-airway-measurements-and-algorithms
2. Methods: https://acil.med.harvard.edu/publications/accurate-airway-wall-estimation-using-phase-congruency

Selecting Airway Locations

1. Select the CT input volume
2. Select an airway location of interest on the Slice window, place the mouse tip inside the airway lumen and **click "a"** to create a new Airway Point for analysis.



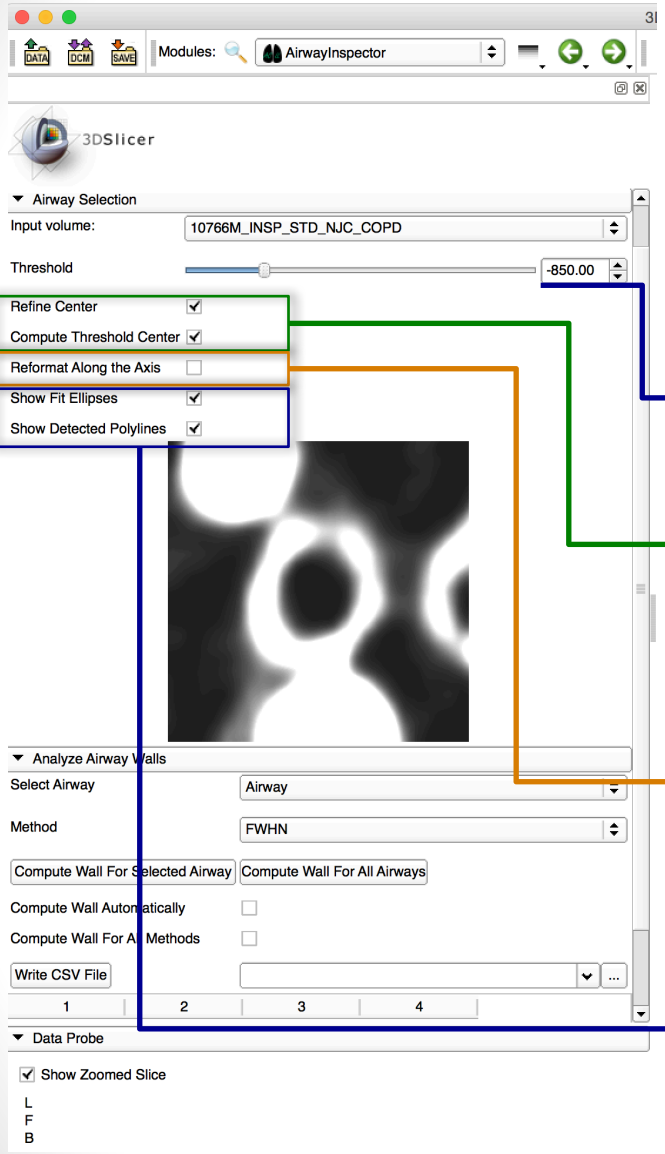
TIP



Enable Zoom view in the Data Probe section for a close-up view of the selected airway

Slicer Chest Imaging Platform – Airway Inspector

Airway Selection Options



- After selecting the airway location, the airway viewer should display a centered airway. Several options enable the user to adjust the centering and reformatting:

Threshold between airway lumen/airway wall.

Tip: Change this threshold only if the airway is not properly centered.

Enable/Disable Centering Options

Tip: Enable refine center for precise centering in small airways

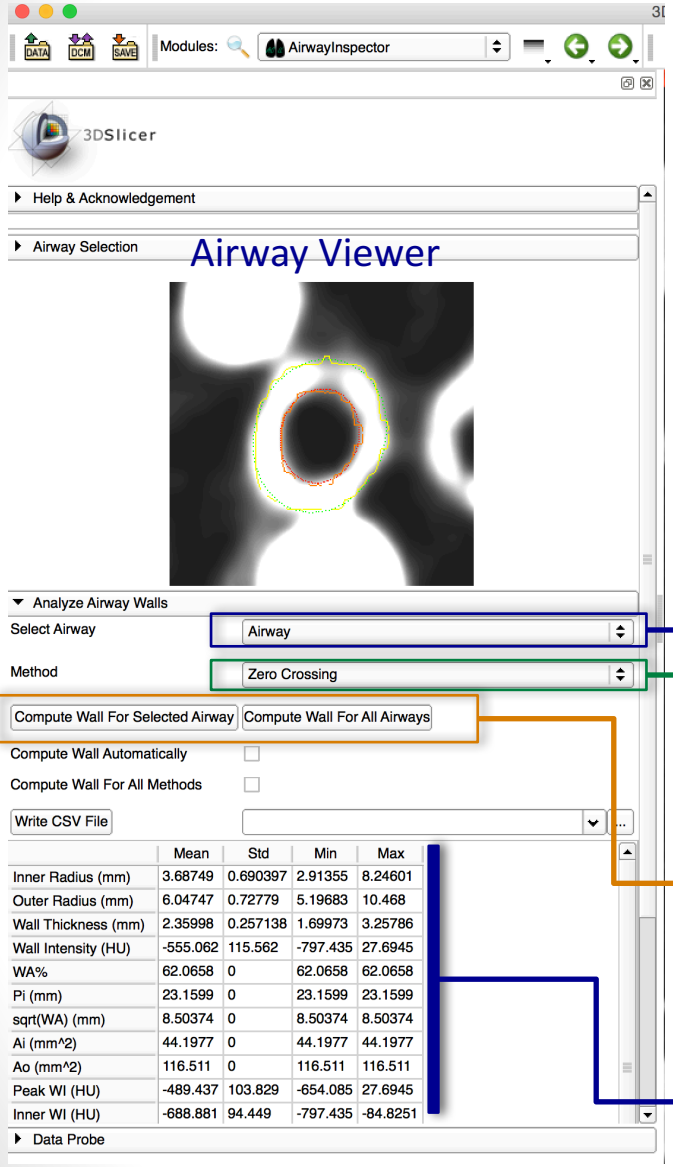
Enable/Disable Reformatting along the airway Axis to obtain a orthogonal slice view of the airway

Tip: Airway Inspector estimates the airway axis computing the Hessian. This option might not work properly if the CT volume does not have high resolution (voxel size < 1.5 mm).

Airway wall segmentation view option

Tip: The airway wall segmentation is performed in the "Analyzed Airway Wall " panel.

Performing Airway Measurements



	Mean	Std	Min	Max
Inner Radius (mm)	3.68749	0.690397	2.91355	8.24601
Outer Radius (mm)	6.04747	0.72779	5.19683	10.468
Wall Thickness (mm)	2.35998	0.257138	1.69973	3.25786
Wall Intensity (HU)	-555.062	115.562	-797.435	27.6945
WA%	62.0658	0	62.0658	62.0658
Pi (mm)	23.1599	0	23.1599	23.1599
sqrt(WA) (mm)	8.50374	0	8.50374	8.50374
Ai (mm^2)	44.1977	0	44.1977	44.1977
Ao (mm^2)	116.511	0	116.511	116.511
Peak WI (HU)	-489.437	103.829	-654.085	27.6945
Inner WI (HU)	-688.881	94.449	-797.435	-84.8251

- "Analyzed Airway Walls" performs automatic airway wall segmentation and the computation of airway metrics

Airway Selector

Tip: After clicking "a" in the slice viewer, a new airway location is created. You can create multiple airway locations. Change the selected airway to display it in the airway viewer.

Airway Wall Segmentation Method

Tip: Zero crossing (of the second order derivative) is a good comprise between accuracy and speed.

Airway Wall Computation

Tip: Click on "Compute Wall for All Airways" if you want to analyzed all the airway locations that have been selected. Airway results are displayed only for the selected airway

Airway Measurements Summary

Tip: You can select a csv file to export the results for all airway locations

Airway Inspector

- The Airway Inspector module is part of the Chest Imaging Platform extension for 3D Slicer (www.chestimagingplatform.org)

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